2.3/1b

$$\lim_{h \to \infty} -2h = -\infty$$

1a

$$\lim_{x \to -\infty} -3 = -3$$

2.2/14

$$\lim_{t\to 1} \frac{t^3+t^2-5t+3}{t^3-3t+2} = \lim_{t\to 1} \frac{(t-1)(t^2+2t-3)}{(t-1)(t^2+t-2)} = 0$$

1) substitution
$$\frac{1^3+1^2-5(1)+3=0}{1^3-3(1)+2=0}$$
Indeterminate
strat: cancel zeros

If $P(a)$ [a polynomial] $=0$
then $P(x) = (x-a)Q(x)$

$$\begin{array}{r} t^2+2t-3 \\ (t-1)\overline{)\,t^3+t^2-5t+3} \\ -(t^3-t^2) \\ \hline 2t^2-5t+3 \\ -(2t^2-2t) \\ \hline -3t+3 \end{array}$$

$$\begin{array}{r} t^2+t-2 \\ (t-1)\overline{)\,t^3-3t+2} \\ -(t^3-t^2) \\ \hline t^2-3t+2 \\ -(t^2-t) \\ \hline -2t+2 \end{array}$$

$$\lim_{t\to 1} \frac{t^2+2t-3}{t^2+t-2}$$

subs $\frac{0}{0}$ indeterminate

$$\lim_{t\to 1} \frac{(t+3)(t-1)}{(t+2)(t-1)} = \lim_{t\to 1} \frac{t+3}{t+2} = \frac{4}{3}$$

2.3/4 $\lim_{x\to-\infty} f(x)=7$ $\lim_{x\to-\infty} g(x)=-6$

a) $\lim_{x\to-\infty}(2f(x)-g(x)) = 2\lim_{x\to-\infty} f(x) - \lim_{x\to-\infty} g(x) = 2(7)-(-6)$
$= 20$

b) $\lim_{x\to-\infty}[6f(x)+7g(x)] = 6\lim_{x\to-\infty} f(x) + 7\lim_{x\to-\infty} g(x) = 6\cdot 7 + 7(-6)$
$=0$

c) $\lim_{x\to-\infty}[x^2+g(x)] = \cancel{\left(\lim_{x\to-\infty} x\right)^2 + \lim_{x\to-\infty} g(x)} = +\infty$

d) $\lim_{x\to-\infty} x^2 g(x) = -\infty$

e) $\lim_{x\to-\infty}\sqrt[3]{f(x)\,g(x)} = \sqrt[3]{\lim_{x\to-\infty} f(x)\cdot\lim_{x\to-\infty} g(x)} = \sqrt[3]{7\cdot(-6)}$
$= \sqrt[3]{-42}$

f) $\lim_{x\to-\infty}\frac{g(x)}{f(x)} = \frac{\lim_{x\to-\infty} g(x)}{\lim_{x\to-\infty} f(x)} = -\frac{6}{7}$

$\frac{-6 \text{ nonzero}}{\text{"}-\infty\text{"}}$

g) $\lim_{x\to-\infty}\left[f(x)+\frac{g(x)}{x}\right] = \lim_{x\to-\infty} f(x) + \lim_{x\to-\infty}\frac{g(x)}{x}$
$= 7+0=7$

h) $\lim_{x\to-\infty}\frac{x f(x)}{(2x+3)g(x)} = \text{"}\frac{\infty}{\infty}\text{"}$ indeterminate

strat: cancel infinities

$\lim_{x\to-\infty}\frac{\frac{1}{x}(x f(x))}{\frac{1}{x}(2x+3)g(x)} = \lim_{x\to-\infty}\frac{f(x)}{(2+\frac{3}{x})g(x)}$

$= \frac{\lim_{x\to-\infty} f(x)}{\lim_{x\to-\infty}(2+\frac{3}{x})\cdot\lim_{x\to-\infty} g(x)} = \frac{7}{(2+0)(-6)} = -\frac{7}{12}$

Sep 7-7:29 AM

h....

$$\frac{x\,f(x)}{(2x+3)g(x)} = \frac{x(1)f(x)}{x(2+\frac{3}{x})g(x)}$$

$$e^{7x}+2e^{8x}$$

$$e^{7x}\left(\left(\frac{e^{7x}}{e^{7x}}\right)+\left(\frac{2e^{8x}}{e^{7x}}\right)\right)$$

$$e^{7x}(1+2e^{8x-7x})$$

$$e^{7x}(1+2e^{x})$$

18?

Sign chart for $X^2 - 4$

(2)

$\frac{+}{+} = +$

$10\ldots$

+ + + | − − − − − | + + + +

$-\pi$  $-2$  $0$  $2$  $100$

$$\lim_{x \to 4^-} \frac{3-x}{x^2-2x-8}$$

+ + + + + + | − − −

$0$  $3$

+ + + | − − − | + + + +

$-5$  $-2$  $0$  $4$  $5$

Sep 7-8:12 AM

2.2/28

$$\lim_{x \to 3^-} \frac{1}{|x-3|} = +\infty$$

$$\lim_{x \to 3^-} \frac{1}{-(x-3)}$$

$$= \lim_{x \to 3^-} \frac{1}{-x+3} =$$

$$|x-3| = \begin{cases} +(x-3) & \text{if } (x-3) \geq 0 \quad x \geq 3 \\ -(x-3) & \text{if } (x-3) < 0 \quad x < 3 \end{cases}$$

2.3/17

End Behavior of a Polynomial matches the end behavior of highest degree term

$$\lim_{x\to+\infty} \sqrt[3]{\frac{2+3x-5x^2}{1+8x^2}} = \sqrt[3]{\lim_{x\to+\infty} \frac{2+3x-5x^2}{1+8x^2}}$$

$$\lim_{x\to+\infty} \frac{x^2\left(\frac{2}{x^2}+\frac{3}{x}-5\right)}{x^2\left(\frac{1}{x^2}+8\right)}$$

$$= \sqrt[3]{\lim_{x\to+\infty} \frac{x\left(\frac{2}{x}+3-5x\right)}{x\left(\frac{1}{x}+8x\right)}} = \sqrt[3]{\lim_{x\to+\infty} \frac{\frac{2}{x}+3-5x}{\frac{1}{x}+8x}}$$

$$= \sqrt[3]{\lim_{x\to+\infty} \frac{x\left(\frac{2}{x^2}+\frac{3}{x}-5\right)}{x\left(\frac{1}{x^2}+8\right)}} = \sqrt[3]{\lim_{x\to+\infty} \frac{\frac{2}{x^2}+\frac{3}{x}-5}{\frac{1}{x^2}+8}} = \sqrt[3]{\frac{0+0-5}{8}}$$

$$= \sqrt[3]{\frac{-5}{8}}$$

$$-\sqrt[3]{\frac{5}{8}}$$